PB81-136392

# The Effect on Exhaust Emissions of the CETEC (Consolidated Engineering Technology Corp.) Atom-X Device

(U.S.) Environmental Protection Agency
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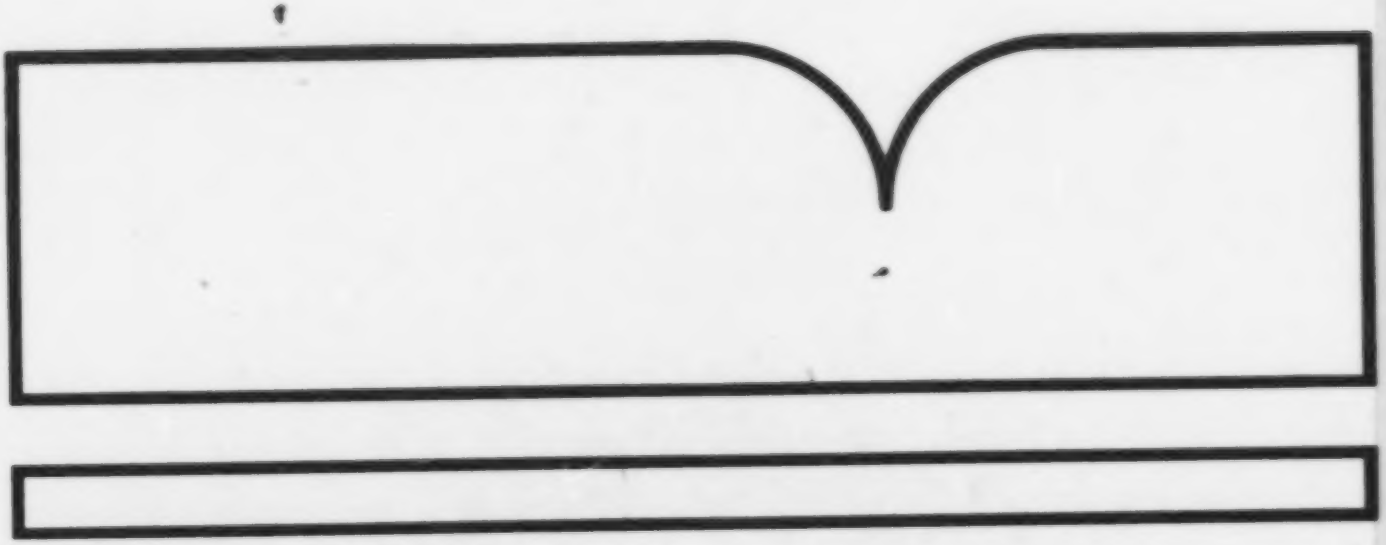

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In September of 1968, an unsolicited proposal from Consolidated Engineering Technology Corp. (CETEC), a subsidiary of Technology Incorporated, was evaluated. The proposal was for a research effort to determine the mechanism by which a device affected the fuel such that combustion chamber deposits were changed and emissions reduced. The device, which is installed in the fuel line between the fuel pump and carburetor, subjects the fuel to a low intensity magnetic field (from a series of permanent magnets) and a 12 volt electrostatic potential.

A decision was made to initiate a test program to evaluate the effect of the device on exhaust emissions. This report summarizes the program and its results.

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| Motor vehicles | Gasoline | Emission control devices | |
| Exhaust gases | Magnetic fields | | |
| Exhaust emissions | Magnets | | |
| Tests | | | |
| Combustion deposits | | | |
| Fuels | | | |

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# The Effect on Exhaust Emissions of the CETEC Atom-X Device

June 1970

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National Air Pollution Control Administration
Department of Health, Education, and Welfare

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SPRINGFIELD, VA 22161

Subject: CETEC Device Evaluation

Background

In September of 1968, an unsolicited proposal from Consolidated Engineering Technology Corp. (CETEC), a subsidiary of Technology Incorporated, was evaluated. The proposal was for a research effort to determine the mechanism by which a device affected the fuel such that combustion chamber deposits were changed and emissions reduced. The device, which is installed in the fuel line between the fuel pump and carburetor, subjects the fuel to a low intensity magnetic field (from a series of permanent magnets) and a 12 volt electrostatic potential. The proposal did not present sufficient data to indicate that there was a significant effect on emissions. It was suggested that more testing was necessary to determine whether or not there really was some effect on emissions. Subsequently, Robert F. Fitch and Dr. Ralph Anderson of CETEC visited with people from MVR&D and DMVPC to present some data they had obtained with the device and discuss its effects in general. At this meeting, the author indicated he could not commit the Division to a test program, but asked if they would be willing to send a device should we decide to evaluate it. They agreed to send a device, and did.

A decision was made to intiate a test program to evaluate the effect of the device on exhaust emissions for the following reasons:

1. There was some evidence, although admittedly meager and somewhat subjective, that there was an effect.

2. The device was novel and could easily be applied to all vehicles new and used.

3. The test program would require a relatively low level of effort.

4. There were no active "in-house" projects under way at the time.

5. The program would make use of the idle Labeco tape controlled chassis dynamometer and provide a training and operating opportunity to the Laboratory Branch personnel.

6. The information generated in the program would be forwarded to MVR&D to be used in further consideration of the unsolicited proposal mentioned earlier.

CETEC has supplied test results which show the device causes:

1. Replacement of hard carbon combustion chamber deposits with a soft gray deposit of less quantity.

2. Less smoky exhaust.

3. Reduced engine knock with lower grade fuels and advanced timing. (This could be the result of lower octane requirement due to less combustion chamber deposits.)

Their explanation is, "CETEC has hypothesized that normally disordered molecular arrays can be oriented by low intensity magnetic or electrostatic fields or both. The molecular orientation then can have possible effects on vaporization and atomization characteristics. The results of the engine testing (CETEC's) indicated that the effects were more closely related to the pre-reaction phenomena, including pyrolysis of fuel, than the terminal phase of combustion process." It appeared when originally evaluating the information supplied, that the device might possibly affect combustion by affecting the formation of free radicals during the combustion process. A change in the quantity or rate of formation of free radicals could beneficially change combustion. This is a remote possibility, however.

The Test Program

In order to evaluate the potential combustion chamber deposit effect, a mileage accumulation type test was necessary. It was also necessary that the mileage be accumulated in the same manner when establishing a baseline emission level as when operating with the device installed. To accomplish this, a route through Ypsilanti, Michigan was driven with the test vehicle while engine speed, vehicle speed, and inlet manifold pressure were recorded on magnetic tape. (The route used is described in Appendix A.) This tape was then used as the input to the Labeco mileage accumulation dynamometer. At approximately 500 mile intervals of

mileage accumulation on this route, emissions from the vehicle were measured on a hot start basis using the '70 Federal procedure simultaneously with the constant volume sampling (CVS) procedure.

The plan was to accumulate mileage on the route until a stable baseline emissions level was established. Then install the device and continue as before until a downtrend in emissions appeared or a few thousand miles had been accumulated. However, mileage accumulation was much slower than planned due to lack of personnel to operate the dynamometer full time, mechanical troubles with the dynamometer itself, and the interference of this test with temperature control in the laboratory testing area. This led to an undesirably high number of stops and starts. As a result, the baseline emissions level was not very stable. As originally anticipated the program was to take only a few months to minimize need for adjustments and maintenance on the vehicle.

## Results

The vehicle accumulated 2932 miles to establish a baseline. This took approximately 8 months. During that time a spark plug fouled and had to be replaced; also the point dwell, and thus idle RPM changed and had to be brought back to specification. About the time the device was to be installed the vehicle emissions suddenly and unexplainably increased. Due to impatience with the duration of the test to date, and finding no obvious reason for the increases, the device was installed and the program continued. 2735 miles were accumulated between September of 1969 and early May of 1970, with the device installed. Table I is a list of the data collected and in Figures 1 and 2 these data are presented graphically. It was hoped that more information could have been obtained from gas chromatography and measurement of clearance volumes using the Holtzman resonator principle but increasing activity on other more important projects prevented the acquistion of these data. A few subtractive column analyses were run. There was no significant difference in exhaust composition compared to baseline.

## Conclusions

Based on this testing program, it does not appear the Atom-X (CETEC) device has a significant effect on exhaust emissions.

## Baseline Mileage Accumulation

| Date | Test No. | Odom. Miles | g/mi (CVS) FID-HC | CO | PPM HC | % CO |
|---|---|---|---|---|---|---|
| 01-31-69 | 143 | 11486 | 7.00 | 50.5 | 577 | 2.64 |
| 02-03-69 | 144 | 11502 | 7.17 | 48.5 | 593 | 2.22 |
| 03-03-69 | 147 | 11875 | 6.13 | 47.6 | --- | ---- |
| 03-05-69 | 155 | 12326 | 5.92 | 42.7 | 479 | 2.20 |
| 03-05-69 | 156 | 12337 | 5.71 | 46.6 | 496 | 2.39 |
| 03-27-69 | 185 | 12899 | 6.68 | 52.9 | 488 | 2.30 |
| 03-27-69 | 186 | 12903 | 6.40 | 50.7 | 451 | 2.42 |
| 04-11-69 | 188 | 13214 | 6.95 | 40.8 | 467 | 2.35 |
| 05-06-69 | 204 | 13820 | 7.51 | 53.5 | 545 | 2.50[1] |
| 05-12-69 | 211 | 13845 | 7.21 | 51.2 | 653 | 2.50[2] |
| 05-12-69 | 212 | 13855 | 6.91 | 46.0 | 662 | 2.80[2] |
| 06-20-69 | 346 | 14290 | 7.17 | 49.8 | --- | ---- |
| 06-23-69 | 347 | 14304 | 7.45 | 52.8 | --- | ---- |
| | (Dynamometer # 2 New test No.series) | | | | | |
| 07-15-69 | 74 | 14320 | 6.53 | 40.1 | --- | ---- |
| 07-15-69 | 75 | 14326 | 6.90 | 49.0 | --- | ---- |
| 09-03-69 | 83 | 14370 | 9.11 | 53.5 | --- | ---- |
| 09-03-69 | 84 | 14375 | 8.78 | 53.4 | --- | ---- |
| 09-04-69 | 85 | 14390 | 8.65 | 49.2 | --- | ---- |
| Average: | | | 7.12 | 48.8 | 541 | 2.43 |
| 09-04-69 | | Installed Device | | | | |
| 09-04-69 | 86 | 14400 | 8.33 | 46.6 | --- | ---- |
| 09-09-69 | 87 | 14420 | 8.48 | 50.2 | --- | ---- |
| 09-09-69 | 88 | 14425 | 8.49 | 47.7 | --- | ---- |
| 11-04-69 | 98 | 15342 | 7.87 | 47.8 | 510 | 2.83 |
| 11-04-69 | 99 | 15351 | 8.00 | 47.8 | 5.2 | 2.73 |
| 12-10-69 | 5-049 | 16026 | 9.01 | 47.4 | 508 | 2.67 |
| 12-12-69 | 5-052 | 16036 | 8.92 | 55.9 | 516 | 2.76 |
| 03-16-70 | 6-103 | 16593 | 7.00 | 48.5 | 466 | 2.79 |
| 03-16-70 | 6-105 | 16600 | 7.20 | 50.1 | 493 | 2.75 |
| 04-09-70 | 6-142 | 17128 | 7.82 | 56.4 | 465 | 3.01 |
| 04-09-70 | 6-143 | 17137 | 7.07 | 51.6 | 452 | 2.86 |
| Average: | | | 8.02 | 50.0 | 490 | 2.80 |
| | | Without Device | | | | |
| 04-11-70 | 6-239 | 17153 | | | 487 | 2.89 |

[1] Misfire 15C.

[2] Misfires, Decels high

Total Test Mileage = 5667
Baseline = 2932
With Device = 2735

## Appendix A

### Mileage Accumulation Route "C"

1. Start on Ramp onto I-94 west from U.S.-12

2. Maintain 50 mph on I-94 to exit for U.S.-12 east into Yspilanti (Business Route to Ypsilanti).

3. Bear right from U.S.-12 onto Michigan Ave. through downtown Ypsilanti.

4. Bear right from Michigan onto Ecorse Road at top of hill.

5. Follow Ecorse Road into Willow Run Airport Main Terminal parking lot.

| | |
|---|---|
| Route distance | 11.5 miles |
| Approximate average speed | 30 mph |
| Cycle duration (Dynamometer) | 21 min |